



(11) (C) 1,334,458
(21) 601,353
(22) 1989/05/31
(45) 1995/02/14
(52) 400-7904
C.L. CR. 134-47

BREVETS
—
MARQUES
DE COMMERCE
—
DROITS
D'AUTEUR
—
DESSINS
INDUSTRIELS
—
TOPOGRAPHIES
DE CIRCUITS
INTÉGRÉS

(51) Intl.Cl. ⁵ B01F-017/00

(19) (CA) CANADIAN PATENT (12)

PATENTS
—
TRADE-MARKS
—
COPYRIGHT
—
INDUSTRIAL
DESIGN
—
INTEGRATED
CIRCUIT
TOPOGRAPHY

(54) Process for Forming Low-Viscosity Emulsions of Polar
Oils in Water

(72) Schambil, Fred , Germany (Federal Republic of)
Striepling, Gert-Lothar , Germany (Federal Republic of)
Tessmann, Holger , Germany (Federal Republic of)

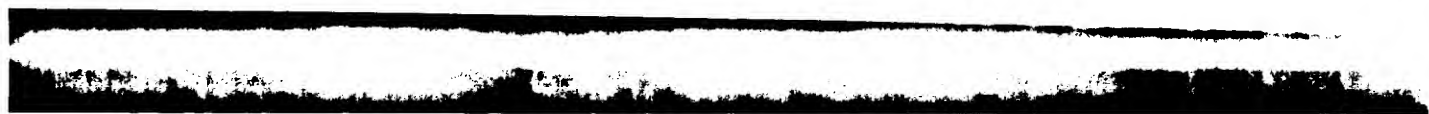
(73) Henkel Kommanditgesellschaft auf Aktien , Germany
(Federal Republic of)

(30) (DE) Germany (Federal Republic of) P 38 19 193.8
1988/06/06

(57) 44 Claims

NO DRAWING





601358

14 FEB. 1995

14458

Abstract of the Disclosure

Low-viscosity oil-in-water emulsions of oils that are at least 50 % by weight monoesters and diesters containing at least 10 carbon atoms and may also contain up to 50% by weight of aliphatic acid triglycerides and/or up to 25% by weight of hydrocarbon oils may be prepared by emulsification with 0.1 to 0.5 part by weight - per part by weight of the oil component - of an emulsifier having an HLB value of 11 to 12 and, preferably, also with 0.1 to 0.5 part by weight - per part by weight of the oil component - of a co-emulsifier of the saturated aliphatic alcohol or aliphatic acid/polyol partial ester type. The emulsion, which contains at least 1 part by weight of water per part by weight of oil component, is prepared at a temperature above the melting point of the mixture of oil component, emulsifier, and co-emulsifier if used, by a process that includes heating the mixed components to a temperature within or above the phase inversion temperature range, subsequently cooling the emulsion to a temperature below the phase inversion temperature range and, optionally, further diluting the emulsion with water.



THE MODIMENTS OF THE INVENTION IN WHICH EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A process for the preparation of an oil-in-water emulsion which inverts at temperatures below 100°C, of an oil component (A) consisting essentially of:
 - (A.1) 50 to 100% by weight of mono- or di-ester molecules that contain at least 10 carbon atoms and that correspond to one of the formulae R^1COOR^2 , $R^2OOC-R^3-COOR^2$, and $R^1COO-R^3-OOCR^1$, in which each of R^1 and R^2 independently represents a C_{1-22} alkyl group or C_{8-22} alkenyl group and R^3 represents a C_{2-16} alkylene group;
 - (A.2) up to 50% by weight of aliphatic acid triglycerides of C_{8-22} aliphatic acids; and
 - (A.3) up to 25% by weight of hydrocarbon molecules, said process comprising the steps of:
 - (I) forming, at a temperature sufficiently high that all components are present in liquid phase, an emulsion consisting essentially of:
 - a selected quantity of component (A);
 - a quantity of water having a weight at least equal to the selected quantity of component (A); and
 - (B) about 0.1 to about 0.5 part by weight, per part by weight of component (A), of a primary emulsifier component having an HLB value of 11 to 12 and consisting of molecules selected from the group consisting of
 - (B.1) adducts of ethylene oxide with C_{16-22} aliphatic alcohols and
 - (B.2) adducts of ethylene oxide with partial esters between C_{3-6} polyols and C_{14-22} aliphatic acids;
 - (II) exposing the emulsion formed in step (I) to a temperature within its phase inversion temperature range; and
 - (III) cooling the emulsion formed in step (II) below its phase inversion temperature range.



- 1 2. A process for the preparation of an oil-in-water
2 emulsion which inverts at temperatures below 100°C,
3 of an oil component (A) consisting essentially of:
4 (A.1) 50 to 100% by weight of mono- or di-ester
5 molecules that contain at least 10 carbon
6 atoms and that correspond to one of the
7 formulae R^1COOR^2 , $R^2OOC-R^3-COOR^2$, and R^1COO-R^3-
8 $OOCR^1$, in which each of R^1 and R^2 independently
9 represents a C_{1-22} alkyl group or C_{8-22} alkenyl
10 group and R^3 represents a C_{2-16} alkylene group;
11 (A.2) up to 50% by weight of aliphatic acid
12 triglycerides of C_{8-22} aliphatic acids; and
13 (A.3) up to 25% by weight of hydrocarbon molecules,
14 said process comprising the steps of:
15 (I) forming, at a temperature sufficiently high
16 that all components are present in liquid
17 phase, an emulsion consisting essentially of:
18 a selected quantity of component (A);
19 a quantity of water having a weight at
20 least equal to the selected quantity of
21 component (A);
22 (B) about 0.1 to about 0.5 part by weight, per
23 part by weight of component (A), of a
24 primary emulsifier component having an HLB
25 value of 11 to 12 and consisting
26 essentially of molecules selected from the
27 group consisting of
28 (B.1) adducts of ethylene oxide with C_{16-22}
29 aliphatic alcohols and
30 (B.2) adducts of ethylene oxide with
31 partial esters between C_{3-6} polyols
32 and C_{14-22} aliphatic acids; and
33 (C) from 0.1 to 0.5 part by weight, per part
34 by weight of component (A), of a co-
35 emulsifier component consisting essen-
36 tially of molecules selected from the
37 group consisting of:



(C.1) saturated C_{16-22} aliphatic alcohols;
and

(C.2) partial esters of C_{3-6} polyols with
saturated C_{14-22} aliphatic acids;

(II) exposing the emulsion formed in step (I) to a
temperature within its phase inversion
temperature range; and

(II) cooling the emulsion formed in step (II) below
its phase inversion temperature range.

3. A process according to claim 1, additionally
comprising a step (IV) of diluting with water the
oil-in-water emulsion formed in step (III).

4. A process according to claim 3, wherein primary
emulsifier component (B) consists essentially of
molecules that are adducts of 8 to 12 molecules of
ethylene oxide with saturated C_{16-22} aliphatic alcohol
molecules.

5. A process according to claim 2, wherein primary
emulsifier component (B) consists essentially of
molecules that are adducts of 8 to 12 molecules of
ethylene oxide with saturated C_{16-22} aliphatic alcohol
molecules.

6. A process according to claim 1, wherein primary
emulsifier component (B) consists essentially of
molecules that are adducts of 8 to 12 molecules of
ethylene oxide with one saturated C_{16-22} aliphatic
alcohol molecule.

7. A process according to claim 2, wherein oil
component (A) consists essentially of molecules
selected from classes (A.1) and (A.2) only and
component (B) consists essentially of molecules that
are adducts of 8 to 12 molecules of ethylene oxide
with one saturated C_{20-22} aliphatic alcohol molecule.



- 1 8. A process according to claim 4, wherein component
2 (A) consists essentially of molecules selected from
3 classes (A.1) and (A.2) only and component (B)
4 consists essentially of molecules that are adducts
5 of 8 to 12 molecules of ethylene oxide with one
6 saturated C₂₀₋₂₂ aliphatic alcohol molecule.
- 1 9. A process according to claim 3, wherein component
2 (A) consists essentially of molecules selected from
3 classes (A.1) and (A.2) only and component (B)
4 consists essentially of molecules that are adducts
5 of 8 to 12 molecules of ethylene oxide with one
6 saturated C₂₀₋₂₂ aliphatic alcohol molecule.
- 1 10. A process according to claim 1, wherein component
2 (A) consists essentially of molecules selected from
3 classes (A.1) and (A.2) only and component (B)
4 consists essentially of molecules that are adducts
5 of 8 to 12 molecules of ethylene oxide with one
6 saturated C₂₀₋₂₂ aliphatic alcohol molecule.
- 1 11. A process according to claim 9, wherein component
2 (C) consists essentially of molecules selected from
3 the group consisting of cetyl alcohol, stearyl
4 alcohol, and monoesters of glycerol, sorbitan, and
5 trimethylolpropane with saturated C₁₄₋₂₂ aliphatic
6 acids.
- 1 12. A process according to claim 8, wherein component
2 (C) consists essentially of molecules selected from
3 the group consisting of cetyl alcohol, stearyl
4 alcohol, and monoesters of glycerol, sorbitan, and
5 trimethylolpropane with saturated C₁₄₋₂₂ aliphatic
6 acids.
- 1 13. A process according to claim 7, wherein component
2 (C) consists essentially of molecules selected from
3 the group consisting of cetyl alcohol, stearyl
4 alcohol, and monoesters of glycerol, sorbitan, and
5 trimethylolpropane with saturated C₁₄₋₂₂ aliphatic
6 acids.



- 1 14. A process according to claim 2, wherein
2 component (C) consists essentially of molecules
3 selected from the group consisting of cetyl alcohol,
4 stearyl alcohol, and monoesters of glycerol, sor-
5 bitan, and trimethylolpropane with saturated C₁₄₋₂₂
6 aliphatic acids.
- 1 15. A process according to claim 4, wherein component
2 (C) consists essentially of molecules selected from
3 the group consisting of cetyl alcohol, stearyl
4 alcohol, and monoesters of glycerol, sorbitan, and
5 trimethylolpropane with saturated C₁₄₋₂₂ aliphatic
6 acids.
- 1 16. A process according to claim 3, wherein component
2 (C) consists essentially of molecules selected from
3 the group consisting of cetyl alcohol, stearyl
4 alcohol, and monoesters of glycerol, sorbitan, and
5 trimethylolpropane with saturated C₁₄₋₂₂ aliphatic
6 acids.
- 1 17. A process according to claim 16, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 18. A process according to claim 15, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 19. A process according to claim 14, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 20. A process according to claim 13, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.



- 1 21. A process according to claim 12, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 22. A process according to claim 11, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 23. A process according to claim 10, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 24. A process according to claim 9, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 25. A process according to claim 8, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 26. A process according to claim 7, wherein the oil
2 component (A), the emulsifier (B) and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 27. A process according to claim 5, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 28. A process according to claim 4, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 29. A process according to claim 3, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.



- 1 30. A process according to claim 2, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.1 - 0.3 : 0.1 - 0.3.
- 1 31. A process according to claim 30, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 32. A process according to claim 29, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 33. A process according to claim 28, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 34. A process according to claim 27, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 35. A process according to claim 26, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 36. A process according to claim 25, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 37. A process according to claim 24, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 38. A process according to claim 23, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.



- 1 39. A process according to claim 22, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 40. A process according to claim 21, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 41. A process according to claim 20, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 42. A process according to claim 19, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 43. A process according to claim 18, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.
- 1 44. A process according to claim 17, wherein the oil
2 component (A), the emulsifier (B), and the co-
3 emulsifier (C) are used in a ratio by weight of A to
4 B to C of 1 : 0.2 : 0.15.

